	Application No.	Applicant(s)
Notice of Allowability	10/608,721	ASHMORE ET AL.
	Examiner	Art Unit	
	Hetul Patel	2186	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *June 16, 2006*.

2. ☒ The allowed claim(s) is/are *1-4, 6-15, 17-22, 24, 27-28, 30-31, 34-42 are allowed; renumbered as 1-7, 9-18, 23, 8, 21, 24-27, 30-34, 22, 19-20 and 28-29, respectively*.

3. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a) ☒ All   b) ☐ Some*   c) ☐ None of the:

        1. ☒ Certified copies of the priority documents have been received.

        2. ☐ Certified copies of the priority documents have been received in Application No. _____ .

        3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).
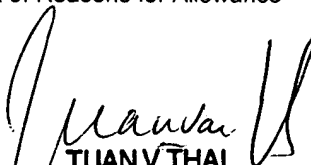
    * Certified copies not received: _____ .

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application. **THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.

    (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached

        1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____ .

    (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____ .

    Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)

2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date _____ .

4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material

5. ☐ Notice of Informal Patent Application (PTO-152)

6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .

7. ☒ Examiner's Amendment/Comment

8. ☒ Examiner's Statement of Reasons for Allowance

9. ☐ Other _____ .

/TUAN V. THAI/
TUAN V. THAI
PRIMARY EXAMINER

DETAILED ACTION

1.   This action is responsive to the Amendment filed on June 16, 2006. This
amendment has been entered and carefully considered.   Claims 5, 23, 25-26, 29, 32-
33 and 43 are cancelled; and claims 1, 20, 24 and 31 are amended. Claims 1-4, 6-16,
17-22, 24, 27-28, 30-31, 34-42 are again presented for examination.

2.   Claims 1-4, 6-15, 17-22, 24, 27-28, 30-31, 34-42 are allowed and renumbered as
1-7, 9-18, 23, 8, 21, 24-27, 30-34, 22, 19-20 and 28-29, respectively.

EXAMINER'S AMENDMENT

3.   An examiner's amendment to the record appears below. Should the changes
and/or additions be unacceptable to applicant, an amendment may be filed as provided
by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be
submitted no later than the payment of the issue fee.

4.   Authorization for this examiner's amendment was given in a telephone interview
with Walter Malinowski (Reg. No. 43,423) on 06/22/2006.

5.   The application has been amended as follows:

CLAIM 16 (Canceled).

CLAIM 1 (Currently Amended):

        A computer program product stored on a computer readable storage medium for
maintaining data access during failure of a first controller in a multiple controller storage
subsystem, the multiple controller storage subsystem having an array of data storage devices and
at least one other controller for managing the data storage, comprising computer readable
program code for performing: in a non-testing mode, the first controller detecting an error in the

first controller and thereby initiating a process to maintain data access during failure of the first controller, the process to maintain data access during failure of the first controller comprising:

- the first controller instructing the at least one other controller to save the at least one other controller's internal state information;

- saving internal state information of the first controller by the first controller;

- the first controller resetting itself after the saving of its internal state information;

- pausing operation of the at least one other controller; and

- the at least one other controller saving its internal state information at the time of pausing, in parallel with the first controller's saving of its internal state information; and

- continuing operation of the at least one other controller, wherein only the first controller resets during the process to maintain data access during failure of the first controller, wherein the first and the at least one other controller make the array of data storage devices appear to a host computer as a single high capacity storage device, wherein the internal state information of the first and the at least one other controller is saved to permit diagnosis of the failure of the first controller, wherein a flag is set when internal status data save operation is occurring to prevent another internal status data save operation from being invoked, wherein the flag is set to prevent the another internal status data save operation from being invoked before the greater time period of a set timeout period and the time period to write the internal status data to a memory, wherein the storage subsystem comprises a Fibre Channel Arbitrated Loop system and the first controller and the at least one other controller comprise host bus adapters.

CLAIMS 17-19 and 39 (Currently Amended):

➤ change the dependency of claims 17-20 and 39 from claim 16 to claim 1.

CLAIM 20 (Currently Amended):

A method for maintaining data access during failure of a first controller in a multiple controller storage subsystem, the multiple controller storage subsystem having an array of data

storage devices and at least one other controller for managing the data storage, the method comprising:

- in a non-testing mode, the first controller detecting an error in the first controller and thereby initiating a process to maintain data access during failure of the first controller, the process to maintain data access during failure of the first controller comprising:

    o the first controller saving its internal state information;

    o pausing operation of the at least one other controller; and

    o the at least one other controller saving its internal state information at the time of pausing without resetting; and,

    o continuing operation of the at least one other controller, wherein only the first controller resets during the process to maintain data access during failure of the first controller, wherein the internal state information of the first and the at least one other controller is saved to permit diagnosis of the failure of the first controller, wherein one of the first and at least one other controller records the destination of the saved internal state information of an other of the first and at least one other controller, wherein a flag is set when internal status data save operation is occurring to prevent another internal status data save operation from being invoked, wherein the flag is set to prevent the another internal status data save operation from being invoked before the greater time period of a set timeout period and the time period to write the internal status data to a memory, wherein the storage subsystem comprises a Fibre Channel Arbitrated Loop system and the first controller and the at least one other controller comprise host bus adapters.

CLAIM 24 (Currently Amended):

A storage subsystem comprising at least two controllers for managing data storage, the at least two controllers coupled to at least one data storage device, the storage subsystem further comprising:

- a first controller of the at least two controllers adapted for saving its internal state information during a failure of the first controller in a non-testing mode, the first controller detecting an

error in the first controller and thereby initiating a process to maintain data access during failure of the first controller; and,

- at least one other controller of the at least two controllers adapted for pausing its operation, and continuing its operation during the failure of the first controller, wherein only the first controller resets during the process to maintain data access during failure of the first controller, wherein the internal state information of the first and the at least one other controller is saved in order to permit diagnosis of the failure of the first controller, wherein a flag is set when internal status data save operation is occurring to prevent another internal status data save operation from being invoked, wherein the flag is set to prevent the another internal status data save operation from being invoked before the greater time period of a set timeout period and the time period to write the internal status data to a memory, wherein the storage subsystem comprises a Fibre Channel Arbitrated Loop system and the at least two controllers comprise host bus adapters.

REASONS FOR ALLOWANCE

6.   The following is an examiner's statement of reasons for allowance:

The prior arts of record do not teach nor suggest, either alone or in combination, **all** the limitations of the amended claims of the current invention (claims 1, 20, 24 and 31); particularly a computer program product, a method and a storage subsystem for maintaining data access during failure of a first controller, comprising: at least one other controller of the at least two controllers adapted for pausing its operation, and continuing its operation during the failure of the first controller, wherein only the first controller resets during the process to maintain data access during failure of the first controller, wherein the internal state information of the first and the at least one other controller is saved in order to permit diagnosis of the failure of the first controller, wherein a flag is set when internal status data save operation is occurring to prevent

another internal status data save operation from being invoked, wherein the flag is set to prevent the another internal status data save operation from being invoked before the greater time period of a set timeout period and the time period to write the internal status data to a memory, as recited in independent claims 1, 20 and 24; and a FC-AL storage system wherein each adapter is adapted for saving internal status data and resetting, wherein a flag is set when internal status data save operation is occurring to prevent another internal status data save operation from being invoked, wherein the flag is set to prevent the another internal status data save operation from being invoked before the greater time period of a set timeout period and the time period to write the internal status data to a memory, as recited in the independent claim 31.

Claims 2-4, 6-15, 17-19, 21-22, 27-28, 30, 34-42 further limit the allowable independent claims. These claims are therefore allowable for the same reason as set forth supra.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."
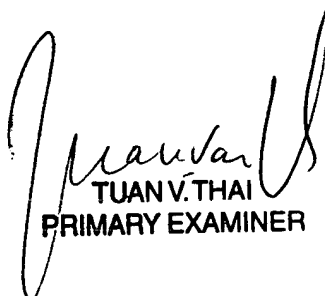

7.   Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hetul Patel whose telephone number is 571-272-4184. The examiner can normally be reached on M-F 8-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matt Kim can be reached on 571-272-4182. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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TUAN V. THAI
PRIMARY EXAMINER